**The National Aeronautics and Space Administration**


*National Space Grant College and Fellowship Program*

# Exploration Systems Mission Directorate Higher Education: Faculty Fellowship Project

## 2009 Announcement

**7 January 2009**

*National Space Grant College and Fellowship Program*

# Exploration Systems Mission Directorate

## Higher Education Faculty Fellowship Project- 2009 Announcement

**Contents** **Page**

# NASA Exploration Systems Mission Directorate
## National Space Grant College and Fellowship Program
## Higher Education: Faculty Fellowship Project
## 2009 Announcement

**I. Introduction**

NASA's Exploration Systems Mission Directorate (ESMD) is soliciting proposals for a summer 2009 higher education opportunity for faculty. The purpose of this project is to prepare faculty to enable their students to complete senior design projects with potential contribution to NASA ESMD objectives. The faculty will work for six weeks at a NASA field Center on a selected ESMD project, convene at Kennedy Space Center (KSC) for one week, and incorporate the ESMD project into an existing senior design course or capstone course at their university in the 2009/2010 academic year. During the six weeks at a NASA field Center, each faculty fellow will work side-by-side with a NASA technical expert. The faculty will gain extensive knowledge on the ESMD project and associated requirements, interfaces and issues affecting the design and potential solution(s). The faculty will develop materials for use at their university during the 2009/2010 academic year in support of the completion of senior design project(s) using a systems engineering approach. At KSC the faculty will share and review all senior design project materials amongst themselves, develop a final report compiling their findings, develop a PowerPoint presentation for the Regional Space Grant Meetings, and participate in the review panel for a Senior Design Course currently in development under a separate contract. At the conclusion of incorporating the ESMD project at their university the faculty fellows will each produce a white paper.

The ESMD project must be selected from the approved list found at http://education.ksc.nasa.gov/ESMDspacegrant/2009_Faculty_Solicitation.htm. Up to 5 faculty fellows will be awarded through this solicitation. Any questions may be directed to Susan Sawyer at 321-867-5482, Susan.G.Sawyer@nasa.gov or Gloria Murphy at 321-867-8934, Gloria.A.Murphy@nasa.gov.

**II. Pertinent Dates**

**Date of Announcement:** **January 7, 2009**

**Proposal Due Date:** **February 17, 2009**

**III. Eligibility Requirements**

Proposals will be accepted from U.S. citizens only. Proof of U.S. Citizenship will be required in order to receive temporary badge access to the NASA field center and KSC. All applicants must be currently employed faculty that teaches an engineering senior design course at an affiliated university of The National Space Grant College and Fellowship Program. A signed letter from the university confirming the agreement to allow the faculty to incorporate the ESMD project into an existing senior design course or capstone course in the 2009/2010 academic year is required.

**IV. Background and Purpose**

On January 14, 2004, President George W. Bush unveiled a new direction and vision for NASA to send humans to explore the moon, Mars and beyond. The Exploration Systems Mission Directorate

(ESMD) is dedicated to creating a constellation of new capabilities, supporting technologies and foundational research that enables sustained and affordable human and robotic exploration.

NASA delivers a comprehensive Agency education portfolio, implemented by the Office of Education, the mission directorates, and the NASA field centers. Through the portfolio, NASA contributes to our Nation's efforts in achieving excellence in science, technology, engineering and math (STEM) education. Three outcomes serve to align all Agency education activities. This announcement maps to Outcome 1: Contributing to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals.

The purpose of the ESMD Space Grant Project is to train and develop the highly skilled scientific, engineering, and technical workforce of the future needed to implement the U.S. Space Exploration Policy.

The following are areas critical to the future of space exploration. All senior design projects are linked to one of the four areas:

**Spacecraft**- Guidance, navigation and control; thermal; electrical; structures; software; avionics; high speed re-entry; modeling; power systems; interoperability/commonality; advanced spacecraft materials; crew/vehicle health monitoring; life support.

**Propulsion**- Propulsion methods that will utilize materials found on the moon or Mars, "green" propellants, on-orbit propellant storage, motors, testing, fuels, manufacturing, soft landing, throttleable propellants, high performance, and descent.

**Lunar and Planetary Surface Systems**- Precision landing hardware, software, in-situ resource utilization (ISRU), navigation systems, extended surface operations, robotics, environmental analysis, radiation protection, spacesuits, life support, power systems.

**Ground Operations**- Pre-launch, launch, mission operations, command and control software systems, communications, landing and recovery.

## V. Responsibilities of the Selected Faculty Fellows

Through this project the faculty fellows will gain extensive knowledge on the selected ESMD project and associated requirements, interfaces and issues affecting the design and potential solution(s) to enable students to complete an associated senior design project(s) during the 2009/2010 academic year at their institution. The awarded faculty's responsibilities will be as follows:

1. Summer 2009 (week 1-6): The awarded faculty fellows will spend six weeks at the respective NASA facility associated with their selected project working side-by-side with a NASA expert. During these 6 weeks the faculty will develop materials in support of the senior design project(s) surrounding the identified NASA ESMD project.
2. Summer 2009 (week 7): The awarded faculty fellows will be provided a one-week break to collect any additional data and prepare for the KSC meeting.
3. Summer 2009 (week 8): The faculty will be required to meet at KSC for a week to:
    a. Share and review all senior design project materials amongst themselves

b. Develop a single combined final report compiling their findings
c. Develop a single combined PowerPoint presentation for the Regional Space Grant Meetings
d. Participate as part of the review panel for a Senior Design Course currently in development under a separate contract

4. September 2009: The faculty fellows will each present at one Regional Space Grant Consortia meeting in the fall of 2009.
5. 2009/2010 Academic Year: The faculty will be required to incorporate the ESMD project into an existing senior design or capstone course at their institution. The faculty will collect evaluation data to assess the effectiveness of the addition of the ESMD project into the existing course. The faculty will serve as the students' main point of contact for the associated ESMD senior design project(s) and coordinate necessary requirements, design reviews, and final presentations with NASA.
6. At the end of this implementation year, the faculty fellow will provide NASA a white paper. The purpose of the white paper will be to share knowledge and lessons learned with other faculty. The paper will document the success of the implementation and any additional findings that may help others implement a similar ESMD Senior Design Project or further the designs produced by his/her students.

Below is a list of deliverables that will be required of all awardees.

**Deliverables**:

Weekly Reporting during summer 2009 due by COB Friday of each week:

- Written status of project materials
- Teleconference status of project

A consolidated Final Report is due by the faculty fellow group on July 24th, 2009. The report shall contain at a minimum:

- Purpose of ESMD Faculty Fellowship
- Overview of ESMD projects selected
- Significance of ESMD projects to NASA's mission and ESMD objectives
- Overview of knowledge gained during summer experience
- Definition and general requirements for senior design projects associated with each ESMD project
- A plan outlining how each faculty will incorporate their selected ESMD project and developed materials into a specific existing senior design or capstone course at their respective university
- Lessons learned throughout the summer experience
- Suggestions for changes/improvements for future faculty project solicitation implementation

A consolidated Presentation for the Regional Space Grant Meetings is due by the faculty fellow group on July 24th, 2009. The presentation shall contain at a minimum:

- Overview of ESMD projects selected
- Significance of ESMD projects to NASA's mission and ESMD objectives
- Overview of knowledge gained during summer experience
- Definition of senior design projects associated with each ESMD project

- Overview of faculty plans to incorporate their selected ESMD project and developed materials into a specific existing senior design or capstone course at their respective university

NASA Education performance metrics database: The faculty must enter a report into the NASA Education database for metrics. Further instructions on how to complete this report will be provided upon award. Entry into NASA Education performance metrics database is due July 24th, 2009.

Senior Design Project Materials due July 24th, 2009:
- Notes detailing the project and background information
- Related research articles (.pdf)
- Related websites

Senior Design Project Results – conducted during 2009/2010 Academic Year in coordination with NASA:
The faculty will coordinate a minimum of three telecons between Senior Design Course students and the NASA technical expert to include:
- Requirements Review with NASA technical expert
- Design Review(s) with NASA technical expert
- Presentation of Final Project Results to NASA technical expert

Final White Paper due electronically to NASA by May 15, 2010 to include:
- Overview documenting implementation experience providing details to help others implement a similar ESMD senior design project(s)
- Assessment Plan results
- Final Senior Design Project(s) Results
- Information to help others further develop Senior Design Project(s) Results (if applicable)
- Additional findings
- Lessons learned

**Travel:**
- Work with the NASA Technical Expert for six weeks at the respective NASA facility.
- Meet at Kennedy Space Center to develop final report, develop presentation and participate in review panel July 20-24, 2009.
- Present at a Regional Space Grant Meeting in the fall of 2009.

**Schedule:**

| | |
|---|---|
| Start work at designated NASA Center: | June 1, 2009 |
| End work at NASA Center: | July 10, 2009 |
| Convene at KSC: | July 20-24, 2009 |
| Implement Senior Design Project: | 2009/2010 Academic Year |
| Presentation to Regional Space Grant Consortia Meeting: | Fall 2009 |
| Submit white paper to NASA: | May 15, 2010 |

## VI. Proposal Format and Content

Proposals should be single-spaced on standard 8 ½ x11 paper, no smaller than 12 point font and with one inch margins throughout. All proposals must be prepared in the following format:

1. **Title Page** (not included in the page count) - Name and contact information of proposing faculty (address, university affiliation, email address, phone number), name and associated identification number of selected ESMD Senior Design Project(s), and the Space Grant Consortium to which the university is affiliated.

   Data Universal Numbering System (**DUNS) and Central Contractor Registration (CCR) -** All applicants will be required to obtain a DUNS and CCR number to apply. This information **must** be on the title page.

   **INSTRUCTIONS ON OBTAINING DUNS & CCR:** Individual/vendors go to http://www.ccr.gov/ and select "Start New Registration" in the upper right hand corner. Once selected, if the individual/vendor does not have a DUNS, there is a link and instructions for the individual/vendor to apply for the DUNS. This link http://www.ccr.gov/handbook.asp contains screenshots to help individuals/vendors complete the registration process. Moreover, individuals/vendors can access this page by selecting CCR Handbook across the top tabs on the CCR homepage. The Handbook tab contains a lot of helpful information which can assist individuals/vendors seeking to do business with the Government. Please do not contact NASA with questions concerning obtaining a CCR or DUNS. If your questions are not answered by the webpage call CCR Assistance Center at 888-227-2423.

2. **Body of Proposal (4 pages maximum)**
   - **Proposal Synopsis –** description of the chosen ESMD project
   - **Significance-** description of the need and relevancy of the proposed project with particular emphasis on importance to ESMD objectives
   - **Mechanisms for integration-** description of how the ESMD project will be implemented into an existing senior design or capstone course at the faculty's university in 2009-2010 as well as how the systems engineering approach will be emphasized
   - **Assessment Plan -** Plan for evaluation approach of project use in senior design course, lessons learned, and impacts
   - **Past Performance -** demonstration of successful implementation of senior design projects into senior design courses and overview of faculty's knowledge/experience pertinent to the chosen ESMD project
   - **Other Resources -** leveraging opportunities, unique capabilities, matching funds, and in-kind support

3. **Schedule** (not included in the page count) - one-page overview of the proposed schedule should include at a minimum the achievement milestones and expected dates of deliverables to NASA.

4. **Budget** (not included in the page count) - total funding requested cannot exceed $29,000. Specific information should be given for salary; supplies and materials for the project; and travel (six weeks at NASA Field Center, one week at Kennedy Space, and travel to present at a Regional Space Grant Consortia meeting).

5. **Appendix (**not included in the page count) -
    - **Mandatory-** a signed confirmation from the university stating that the faculty is a US citizen and will be implementing the ESMD project in a senior design or capstone course in the 2009-2010 academic year
    - Faculty may also use this section to submit their CV

## VII. Proposal Evaluation Criteria

The following criteria will be used in the evaluation process:

**Mandatory Logistics**

- Faculty contact information and institution identified on Title Page
- Affiliated Space Grant Consortium identified on Title Page
- Chosen NASA ESMD Project and Number identified on Title Page
- DUNS and CCR number on Title Page
- Signed confirmation from university provided in Appendix stating faculty's US citizenship and commitment to implement ESMD Project in 2009/2010 academic year at university

**Merit**

- Demonstrate alignment with ESMD objectives
- Alignment with ABET standards; along with evidence of past performance of teaching senior design courses
- Systems engineering approach to the project

**Contribution to NASA Workforce Development**

- **Content:** Ability to implement a meaningful hands-on ESMD-relevant senior design project.
- **Continuity**: Senior design project implemented that demonstrates interest in NASA and connects and prepares students for the workforce.
- **Diversity**: Proposal makes a demonstrable effort to attract a diverse group of participants, including underrepresented minorities and women; where appropriate, the project promotes opportunities for students at minority serving institutions.
- **Evaluation:** Appropriate quantitative metrics and qualitative outcomes.
- **Budget:** Adequate, appropriate, reasonable, and realistic budget.

## VIII. Proposal Submission

Electronic copies of proposals must be received no later than: **5 p.m. Eastern Time, Tuesday, February 17, 2009**. Late proposals will not be considered.

The proposal will be submitted online at https://secureworkgroups.grc.nasa.gov/esmd-sg-fp . Membership at that site is required to submit the proposal. To join, click on Option "A". The password is **ESMDFaculty**. The proposal may be saved as a draft before the final submission.

Applicants will be advised by electronic mail when selections are made.